Attachment H. I&E Data Management Strategy

A data management strategy providing a methodology for data standards at the enterprise level addresses the information data and lifecycle of the enterprise from identification and analysis through user discovery and applications processing. One of the CIO goals, as confirmed by the Deputy Secretary of Defense in Management Initiative Decision (MID) 905[1], is to populate the network with all data (intelligence, non-intelligence, raw, and processed) and change the paradigm from "process, exploit, and disseminate" to "post before processing." All data is advertised and available for users and applications when and where they need it, allowing users and applications to search for and "pull" data as needed. As the DoD moves to a Net-Centric environment, the goal of "post before processing" with respect to data will make data readily available to the user before normal processing and dissemination have completed, thus allowing users to make more timely and effective decisions[2]. This paradigm will require standards for data such that users can easily discover and understand the data assets of the enterprise, and use this data correctly, effectively, and in a timely manner. In addition, data will be available to a broader base of qualified users, not just the current users of I&E's data assets. These unplanned or unanticipated users will require sufficient understanding of these data assets so as to be able to pull and analyze data for effective analysis and decision-making. This paradigm will also change the focus of data from the application that processes it to the role of the data as it applies to the enterprise, and how it is processed and used by the enterprise.

All of the above initiatives taken collectively have the potential to contribute to improved data interoperability. But they do not provide a cohesive data management strategy for the I&E Community. Existing methods are not adequate. The DoD CIO guidance has provided for a decentralized approach to data management which can be applied to DoD Business and Warfighting requirements within the I&E Community. A successful I&E-wide Data Management Strategy depends on each I&E COI managing its key data assets and providing for interoperability within its community domain and with other DoD COIs.

A strategy is needed to develop and maintain data consistency where appropriate within the I&E Community and with other DoD Communities. The I&E data management process needs to ensure that it supports the planned DoD Metadata Registry. The I&E business transformation process by itself does not ensure timely, accurate and actionable data to meet DoD Business and Warfighting needs. The I&E business transformation process supports the transformation of real property business processes, but does not address the problem of how to enable data exchange across the I&E Domain for all I&E

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1. [1] Management Initiative Decision 905, Net-Centric Business Trasnformation and eGovernment, December 24, 2002, p. 4.

[2] Memorandum, DoD Net-Centric Data Strategy, 9 May 2003, p. 3.

end-to-end processes, or between the DoD Business and Warfighting Enterprise Mission Areas in support of Enterprise business processes. Portfolio Management provides for an improved baseline for the Military Services and Defense Agencies to support I&E Domain capabilities, but it requires an overall data management strategy that integrates each of their plans and is directly linked with the I&E architecture to provide for a migration path for legacy systems that are replaced by new modernization programs over the coming years. A Data Management Strategy is required to bridge this gap between the I&E architecture and the implementation of the "To-Be" solution. The result of this recognition has been the requirement to develop a formal Data Management Strategy for the I&E Domain. Specifically, the I&E Data Management Strategy will:

- Increase the percentage of data available to the enterprise
- Ensure data is visible, accessible and understandable
- Ensure the integrity and reliability of real property data
- Require the Data Management Strategy to be implemented throughout the I&E Community

The Data Management Strategy will increase the use of enterprise and community data by ensuring that data is understandable, trusted, interoperable, and responsive to user needs. Also, the Data Management Strategy will enable DoD-wide and enterprise-wide interoperability by providing users, developers, system architects, and integrators with insight into the discovery, accessibility, data content, and interoperability of data through the DoD and I&E Metadata Registry. The result is that decision-makers have access to clearly defined, reliable and trusted data for planning, analysis, modeling and reporting to meet mission requirements.

DoD has embarked on a deliberate effort to bring the DoD Enterprise within the context of the DoD Architecture Framework (DoDAF), Version 1.0, previously known as the Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) Architecture Framework. The DoDAF defines a common approach for DoD architecture description development, presentation, and integration, consisting of products in 3 areas: the Operational View (OV), Systems View (SV) and Technical Standards View (TV). Architectures consisting of products from these 3 areas are considered integrated architectures, as the products from each area have logical relationships to the products in each of the other areas. Figure 2 describes the different product areas of the DoDAF currently being used within DoD.

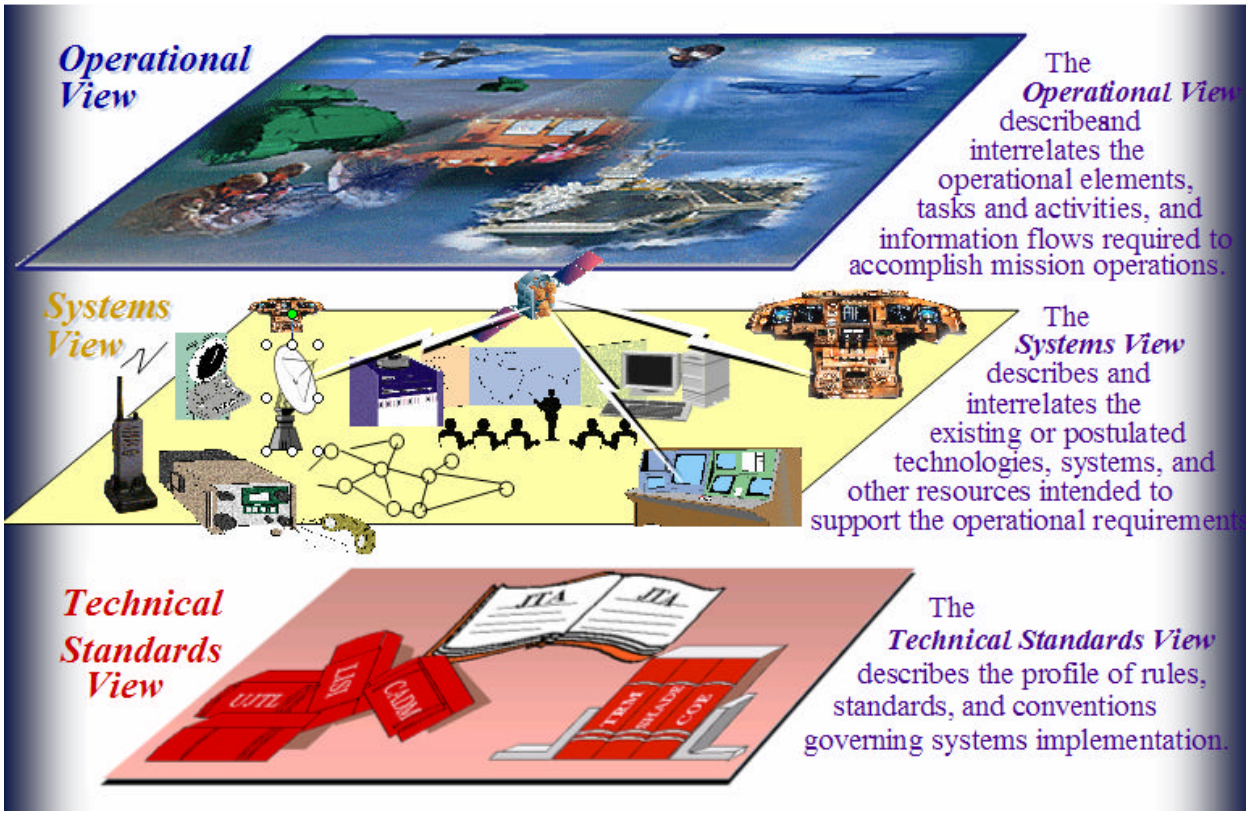

Figure 1: The Component Views of the DoDAF

Several projects are focused on this objective, including the development of the I&E architecture that is developed using the DoDAF. The I&E Community recognizes that a key element of the I&E development process must focus on data related to the RPI, RPM and ESOH business areas. The result of this recognition is the development and implementation of a formal Data Management Strategy. The Data Management Strategy is the transition piece and foundation of the implementation of the I&E architecture.

The purpose of the I&E Data Management Strategy is to define the vision, guiding principles, goals, concepts, and approach for the I&E Community Data Management Strategy. The vision, guiding principles, and goals lay the groundwork for a Data Management Strategy by describing what needs to be achieved. Their foundation is firmly aligned with the documented needs of the DoD CIO efforts and the Warfighter to satisfy those needs within the Net-Centric Global Information Grid (GIG). The I&E Data Management Strategy describes the methodology and associated techniques that will be used. The concept will enable DoD-wide enterprise-wide interoperability by providing users, developers, system architects, and integrators with insight into the discovery, accessibility, data content, and interoperability of data. The approach provides a high level roadmap for implementing the I&E Data Management Strategy across the I&E Domain within the context of the I&E COI. The I&E Data Management Strategy will establish, develop, maintain, and institutionalize several concepts:

- The Data Management Strategy Implementation Process

- Data Management Strategy goals
- I&E COIs
- Identification of Authoritative Data Sources
- I&E data standards, methods and processes
- I&E Community Metadata Registry and Storage
- Data Management Strategy Awareness, Training, and COI Involvement

A successful data management strategy approach depends on the support of the stakeholders within the I&E Community and their full-commitment to achieving the I&E Data Management Strategy Vision and Goals.

This Data Management Strategy applies to all DoD agencies that participate in the management and use of real property data. The scope includes the entire real property functional domain. The Data Management Strategy provides a process for defining, validating, and implementing the Data Management Strategy and identifies the role of the I&E Community to support its successful implementation. The intent is to work directly with Military Services and Defense Agencies in their modernization efforts to establish enablers that realize functional needs. This will provide the necessary planning information to implement the Data Management Strategy throughout the I&E Community, including feasibility, scope, detailed requirements, budget requirements, governance, infrastructure, and timeframe. The Data Management Strategy also ensures that the I&E Community approach is linked to and supportive of the overarching DoD CIO Data Management Strategy.

I&E Data Management Concept

The Data Management strategy for the I&E Domain will form the basis for the stewardship of knowledge, information and data assets related to the domain including but not limited to RPI, RPM and ESOH. This stewardship pertains to identifying the data for which the I&E Domain is the authoritative data source; identifying COI's to support the domain with respect to establishing standards for this data to provide for its understanding, integrity and dependability; and implementing methodologies for the use of this data within the enterprise. An overview of the I&E Data Management Strategy is provided in Attachment H of this document.

The philosophy of the I&E Domain with respect to data management is:

- Single point-of-entry for data
- Authoritative source for real property information and data assets
- Shared authorized access to real property information and data assets

- Unique identification of all real property assets for which the DoD has a legal interest

- Data standardization with respect to the attributes defined and to be used for the identification of real property assets

- COIs consisting of subject matter experts to support the analysis and identification of requirements with respect to RPI, RPM and ESOH business processes, data asset identification, requirements and reporting

- Lifecycle management of all knowledge, information and data assets for which I&E is the authoritative source

RPI data requirements have been defined by three sources:

- Draft Department of Defense Instruction (DoDI) 4165.14, Inventory of Military Real Property

- Assessment of DoD Real Property Information Systems dated August 8, 2001 developed by Calibre Systems, Inc.

- Data requirements identified by the RPI COIs representing the Military Services and Defense Agencies

Communities of Interest (COI)

Using the Draft DoDI 4165.14 Inventory of Military Real Property and Assessment of DoD Real Property Information Systems as a basis, I&E focus groups have been organized including members (SMEs) representing the I&E Domain, the Military Services (Army, Air Force, Navy, United States Marine Corps), Washington Headquarters Services (WHS), and Defense Agencies including the Defense Logistics Agency (DLA) and the Department of Defense Education Activity (DoDEA). These focus groups comprise Real Property COIs representing the I&E Domain, and have helped to define the standards for stewardship of I&E knowledge, information and data assets.

According the Net-Centric Data Strategy (DoD CIO Memorandum, 9 May 2003), COIs are defined as collaborative groups of stakeholders, users, data developers, and providers with shared goals, interests, missions or business processes, operating under agreed upon terms. The I&E Data Management Strategy will take advantage of the new decentralized DoD CIO approach to interoperability that encourages each institutional COI, e.g. I&E Domain, to organize its data structures to best suit its unique customer needs. The I&E Data Management Strategy will support the concept by further subdividing the Real Property COIs into Functional COIs that are focused on specific, well-defined and bounded areas within the I&E Domain and in alignment with the DoDAF Operational Views. This is illustrated in the Figure 3.

Figure 2: I&E Communities of Interest

The initial transformation effort of the I&E Domain is focusing on three business areas: RPI, RPM and ESOH. Each of these functional areas consists of one or more COIs. For example, the I&E Domain has formed a number of RPI COIs to date to identify data elements and business rules for which I&E is the authoritative source. Initial COIs have been formed to identify:

- Core Data Elements, definitions, business rules and validation criteria with respect to real property assets that are required to support:
  - asset identification
  - accountability
  - management
  - legal requirements
  - physical attributes and description

- Data elements and business rules to support accounting and fiduciary for real property assets as set forth by the Federal Accounting Standards Advisory Board and DoD Financial Management Regulation.

Additional COIs will be established as required to support the I&E Community.

Using COIs, the I&E Domain will form groups of SMEs as required to address functional areas within the domain, as well as between or outside domains. COIs will be used to support the definition of the RPI requirements with respect to business process development and data asset identification, as well as to provide support to the I&E Domain throughout the lifecycle of the architecture. This capability allows the I&E Domain to address issues with the most knowledgeable resources, e.g. SMEs, thereby gaining stakeholder confidence in the "To-Be" system as well as increasing the quality and integrity of the architecture. The current job of the COIs is to identify the information and data asset requirements of the "To-Be" system, as well as to identify current and potential users, e.g. unanticipated users, of the system. This in turn requires data assets to be identified to satisfy the requirements of current authorized users of real property data, as well as potential, unanticipated users once the real property data assets are made available via the I&E and DoD Metadata Registries. The I&E Functional COIs must engage a range of users, data providers, and developers in creating catalogs and developing domain-specific metadata. Users need to be asked to provide feedback about community services and data sources. This feedback, coupled with increased data asset visibility, will increase the integrity and quality of data. Additionally, the feedback allows COIs and data producers to identify previously unanticipated users and uses for data.

The formation of Functional COIs also will support the formation of "Dynamic COIs" that are more transitory and ad hoc. These dynamic COIs will support end-to-end business processes that may cross multiple Functional I&E COI boundaries and non-real property COIs such as Accounting and Finance, Acquisition and Human Resources.

Authoritative Data Source

A direct result of the GIG is that more data will become more widely available in the DoD Enterprise., and it will be possible to find the same piece of information in more than one place. This poses a dilemma for users of real property data as the user will need to determine which source of data should be used, (e.g. authoritative by definition, trust and reliability, currency with respect to update), and the authority or pedigree of the data.

The I&E COIs will establish authoritative sources for key data assets within their communities. These authoritative sources can come from a variety of resources including, but not limited to:

- DoD Military Services and Defense Agencies
- United States Federal Agencies

- General Services Administration (GSA)
- Environmental Protection Agency (EPA)

- Institutions, organizations, and committees:
  - National Institute of Standards and Technologies (NIST)
  - International Organization for Standardization (ISO)
  - Federal Geographic Data Committee (FGDC)
  - International Alliance for Interoperability (IAI)

The COIs will register their designated Authoritative Data Sources in the I&E Domain Metadata Registry and in the DoD Metadata repository, allowing users and applications to understand the authority for data sources. The I&E Domain and COIs are responsible for resolving potentially conflicting sources, and where appropriate, coordinate with the DoD-wide governance body through the I&E Domain to identify a single, authoritative source. The importance of this will increase as the DoD domains begin the implementation of their respective architectures in their "To-Be" solutions. The authoritative sources of each data asset will also be responsible for developing standardized interfaces to make sure that data is understood, maintained throughout its respective lifecycle, shared, and is audited throughout the enterprise.

Metadata

Information and data assets of the I&E Domain may be used locally within the domain, as well as shared across the enterprise and accessed by users and COIs in other domains. These information and data assets are maintained in shared spaces, e.g. databases and flat files. Shared data assets are of 2 types:

- Structured, e.g. Relational Database Management Systems (RDBMS), geographic information systems, object-oriented, and Extensible Markup Language (XML);
- Unstructured, e.g. Email, documents, images, video and audio files.

These shared data assets may be in centralized or distributed systems and storage, reside in one or more systems, named differently and be in different formats. Users of shared data assets query data metadata sources to discover, understand, locate and access (e.g. "pull") desired data assets from different data sources within the enterprise. These users have been classified into 3 entity types within the GIG:

- End users – Discover and use shared data assets in support of DoD Business and Warfighting mission requirements, modeling, decision-support, analysis and reporting.
- Developers – Discover and use shared data assets in the design and build of applications and systems.

- Applications and services – Access metadata registries to locate data and storage locations to perform their functions and processing, e.g. translation services.

As defined previously, metadata is data about data. Metadata is maintained in the GIG Enterprise using 2 facilities:

- Metadata registry - A system that contains information that describes the structure, format, and definitions of data. A metadata registry is a software application that uses a database to store and search data, document formats, definitions of data, and relationships among data. System developers and applications are the predominant users of a metadata registry. Metadata registries provide a template of what information is required to be filled out for each data asset, e.g. what metadata information will be stored for each data asset.
- Metadata catalog - A system that contains the instances of metadata associated with individual data assets of the enterprise. A metadata catalog is a software application that uses a database to store and search records that describe such items as documents, images, and videos. Search services, e.g. portals and applications, use metadata catalogs to locate the data assets that are relevant to a user's query thereby providing the vehicle for data asset discovery for the user.

Using catalogs, registries and databases, data and information about data can be stored and published allowing users in the enterprise to access these data stores for information as needed. It allows users and applications to quickly identify data, the value of data to them, and the source, classification and attributes of the data. Metadata also allows users to understand these shared data assets, and to use this data properly. Metadata can be of 2 types:

- Technical metadata - Used by the Information Technology (IT) staff including developers. This type of metadata identifies the technical characteristics of shared data assets such as system, database, and table and column information.
- Business metadata - Used by users supporting the enterprise with respect to business processes. This type of metadata includes subject areas, definitions, synonyms, business rules, and domain rules and values (e.g. pick lists).

Metadata can be used to enhance the value and usability of data assets. In the past, the DoD data administration approach used metadata to define data structures and relationships, data models, to support the development of databases and software applications. In this manner, structural or technical metadata is used to define how data assets are physically composed and includes information that describes the relationships between the data asset and what keys and fields are used in its definition. This type of approach best supports IT users including data modelers and developers, but does not support the business users.

Business users need to understand information and data assets from their perspective as end users. Their requirements require them to understand locate and understand the data

that they require to perform their tasks, such as clear and consistent definitions of these assets in terms of business processes, business rules, and domain rules and values.

Metadata can be associated with all data in the enterprise for the purpose of publishing data assets for discovery. Metadata that describes or summarizes key attributes and concepts of a data asset can be used in the discovery process. This business metadata allows users and applications to quickly search through a wide range of data assets to identify those assets that are most valuable to support their needs. Similarly, users can subscribe to data assets. Subscription allows users to be proactively notified of planned and actual changes to metadata and data assets.

To support the use of metadata, 2 additional methods will be used within the I&E Domain for data asset definition and description: shared vocabulary and taxonomies. A shared vocabulary provides a common method of describing the information and data assets of the enterprise. Using the Enterprise Business Process Model (EBPM) Enterprise Data Model (EDM, OV-7), a common "language" or shared vocabulary will be used to identify the processes and data assets of the enterprise, thereby eliminating Domain, Service and Agency-specific terms of reference. For example, the EDM will contain the attribute name, attribute definition, data type, optionality, authoritative data source (e.g. Domain), creator, create date, update date and archive date for reach data asset identified in the model. A taxonomy is a hierarchical structure used to classify items with similar characteristics into categories and subcategories. This was illustrated earlier with respect to real property assets discussed in the Core Data Elements section of this document. Taxonomies allow users to discover assets by drilling down through categories and sub-categories until the relevant data assets are discovered. As a part of the Data Management Strategy, the I&E Domain and its COIs will define and publish the shared vocabulary and taxonomies used to define the shared data assets for which the Domain is the authoritative source.

These types of metadata, together with vocabularies and taxonomy structures used for organizing and grouping data assets, interface specifications and mapping tables will provide a richer semantic understanding of all data and metadata and provide all users in the enterprise with the means of discovering and understanding the data assets available within the enterprise. Using the RPI Core Data Elements described above, and applying the concepts identified in this section, (e.g. business and technical metadata, shared vocabulary, taxonomies), users of real property information and data assets will be provided with a comprehensive and rich environment that provides for the publishing, discovery and understanding of these assets. The end result will be more effective and timely data analysis, reporting and decision-making through data discovery, understanding and access.

The Enabling Role of Geospatial Information for the RPI

As mentioned before, the "To-Be" architecture will incorporate leading private and public sector real property inventory practices and technology. Geospatial information has been commonly employed on a broad basis by RPM systems as a means to both identify the unique location of a physical asset, as well as serve as a quality control measure for real property asset records. An example of the latter instance is when tabular real property records are associated with a specific x,y, coordinate location in the real

world. If such a locational tag were associated with each record, and then these locations were visualized within a geographic context, such as a digital map conveyed through the use of geographic information systems (GIS), redundant records would be immediately recognized. Furthermore, while knowing the specific location of an asset may be valuable, what is often more critical is knowing what is located near the asset, especially when considering the potential transfer of land assets. For these reasons, geospatial information and technologies will be available and an integral part of the DoD RPI system in the future. It is currently envisioned that the RPUID will be the integration mechanism between the tabular data attributes provided by the Core Data Elements and the ability to analyze and visualize these assets within a geospatial context. Together with the RPI Core Data Elements, a more complete picture of real property assets can be made available to the DoD user community. In the "To-Be" environment, RPI, RPM and ESOH data assets will able to be more fully analyzed and lead to more informed decisions through the process of appending geospatial knowledge to the RPI data model and applying GIS technologies to the RPI effort.

The DoD is now embarking on a comprehensive program known as the Defense Installation Spatial Data Infrastructure (DISDI) that will allow the RPI to take full advantage of these geospatial technologies. The RPI will be the first major DoD transformation program to use the DISDI to place all DoD real property assets within georeferenced satellite and airborne imagery, alongside other installation and environmental features. In turn, this will enhance the Military Services' and Defense Agencies' ability to track asset location, network systems, special features, political boundaries, topography and other essential characteristics. The DISDI will enable integration of non-DoD databases with the RPI for more comprehensive information and enhanced analytical, planning and utilization functions. The pre-cursor to the DISDI, known as the Installation Visualization Tool, was deployed in June 2004 and has already convinced senior leaders involved with base realignment and closure that the combined use of georeferenced imagery and readily available commercial off-the-shelf GIS software lends remarkably effective situational awareness for their more informed decision-making. The evolution of the DISDI will be closely coordinated with the RPI milestones to ensure that economies of scale are secured for the DoD, since other critical missions such as homeland defense and critical infrastructure protection can also benefit immensely from better understanding the nature and location of real property assets. Ultimately, the DISDI and RPI efforts will yield a standards-based architecture that will promote interoperability and integration of real property systems throughout the Department.

I&E Data Management Strategy Goals

The I&E Data Management Strategy has been developed in response to several objectives and efforts including:

- The strategy and implementation of the GIG by DoD,
- The mission of the Department with regard to the management of real property,

- The reengineering of the Department with regard to its business processes,
- The use of real property data as a corporate asset to drive end-to-end processes, systems integration and decision-making, and
- Consistent, accurate, reliable and trusted real property asset accountability, management and reporting.

In response to these objectives and efforts, the goals of the I&E Data Management Strategy have been identified as follows:

- Establish and present the I&E Data Management Strategy for the domain, and obtain participation by the Military Services, Defense Agencies, and DoD Business and Warfighting Enterprise Mission Areas.
- Facilitate and coordinate COI collaboration and objectives to support DoD Business and Warfighting objectives.
- Visibility, access, understanding and standards implementation with regard to RPI information and data assets to promote consistency, understanding, use and interoperability.
- Increase the use of I&E real property data assets through authoritative sources, trust, interoperability and responsiveness to business and user needs.
- Lifecycle management of the real property information and data assets by the I&E Domain and COIs.
- Promote awareness of the I&E Data Management Strategy through the domain web site and training, and encourage feedback from COIs to measure the effectiveness and success of the strategy implementation.

To be effective, the I&E Data Management Strategy must support the overall data strategy of the GIG, as well as support and integrate with the respective data strategies of the DoD Business and Warfighting Enterprise Mission Areas. To accomplish this, communications will be initiated and maintained with the COIs within the enterprise to foster understanding and encourage interoperability. The goals of the strategy will be evaluated against metrics to be developed so that the performance and effectiveness of the Data Management Strategy can be measured.

I&E Data Management Strategy Approach

Shared data assets, e.g. RPI Core Data Elements, represent data that must be shared across applications and/or organizational boundaries for the performance of DoD real property operations. These shared data assets may reside on centralized and/or distributed data stores and may not use common structures, naming conventions, or definitions. Metadata repositories are data stores containing information that describes data assets and/or provides rules for acting upon that data, e.g. RPI Core Data Elements. Metadata repositories store the metadata that drives the DoD Net-Centric approach. These two concepts provide the environment that the I&E Data Management Strategy is designed to address.

The I&E Data Management Strategy will provide an approach consistent with the DoD direction, and that will address the needs of the Real Property Community. The approach will allow the Data Management Strategy to be integrated into the I&E Domain in conjunction with the ongoing Business Transformation efforts of the Domain.

The following are the proposed steps for the implementation of the I&E Data Management Strategy. Prior to the implementation of the strategy, program and project plans will be developed and agreed to by the I&E Domain and the COIs that support it.

Data Management Strategy and Implementation

The Data Management Strategy implementation will identify the processes, techniques and the technical architecture so as to ensure that the I&E Data management architecture is in compliance with guidance provided at the DoD-level. The strategy will be comprehensive and extensible so as to support the current capabilities of the I&E Domain and COIs with respect to data management, as well as capabilities which may be defined later. The initial increment of the strategy will include the RPI, involving project champions, stakeholders, and COIs. This increment of the implementation will provide a proof-of-concept, allowing the data management strategy to be validated, and the architecture and technical solution to be developed.

The development of the technical solution involves technology and product evaluation and selection, repository development, and metadata definition and loading. The implementation will also allow for integration into the GIG and BEA architectures, with Domain-specific services and tools developed and integrated as required.

Stakeholders, Data Champions and COIs

Stakeholders in the I&E Data Management Strategy will need to be identified so that awareness, understanding and support of the Strategy can be obtained. Stakeholders most importantly will be those entities supporting the I&E Domain both internally (e.g. Domain staff, Military Services and Defense Agencies) and externally (e.g. Business Domains, GIG Entities). Awareness of the strategy is critical to its success so that it can be promoted and understood by those directly supporting it as well as those potentially impacted by it, e.g. interoperability, COI use and participation.

Data champions will need to be identified, and are entities responsible for real property information and data assets. These entities include:

- Program management – Provides oversight of Data Champions and COIs, and provide support for budge, resource and policy issues related to the implementation and support of the Data Management Strategy
- Technical – Provides technical support for the implementation and support of the Data Management Strategy including architecture development, technical specifications, and interoperability and integration.
- Functional – Provides functional and business expertise related to information and data structures used in support of real property.

Data champions provide more direct support of the Data Management Strategy than do stakeholders as they are more actively involved. Data champions will be defined as required for the I&E Domain and for the functional COIs that support it.

COIs will be used to support and organize the information and data structures supporting real property to best suit the needs of real property data customers as encouraged by the DoD CIO. COIS are groups of organizations and users that have shared goals, interests and missions. In the DoD community, COIs include at the highest level GIG entities, the Business Enterprise Mission Area, each of the Business domains, down to the functional groups supporting each of the domains. COIs such as these will be formed and used as required to support the implementation and ongoing support of the Data Management Strategy.

Architecture Development

Key to the development and implementation of the Data Management Strategy is the development of an architecture that defines it. The architecture will define the structure of the components supporting the strategy including the vision, scope, organizations and COIs, processes, data and relationships that comprise the strategy. In addition to documenting the principles and guidelines governing the Data Management Strategy, the architecture will provide and reinforce an understanding of the business and mission requirements of the strategy for the Domain and COIs that will participate and support the strategy during and after its implementation. The architecture will help in familiarizing Domain and COI members with the strategy, as well as how the strategy integrates with the data strategies of the GIG, BEA and the Business Domains.

Key to developing the architecture to support the strategy is the identification of the architectural products from each of the views (e.g. Operational, System, and Technical) that will be used. The DoDAF recommends 8 architectural products to support an integrated architecture:

- AV-1: Overview and Summary Information
- AV-2: Integrated Dictionary
- OV-1: High-level Operational Concept Description
- OV-2: Operational Node Connectivity Description
- OV-3: Operational Information Exchange Matrix
- OV-5: Activity Model
- SV-1: System Interface Description
- TV-1: Technical Standards Profile

Additional DoDAF products will be identified as required to support the Data Management Strategy such as the OV-7 Logical Data Model and OV-6c Operational Event/Trace Description.

Governance

Governance is the organizational structure that will oversee the development and implementation of the Data Management Strategy within the I&E Community. Roles and responsibilities of those supporting the strategy will be defined by the organization, as well as performance against metrics, expectations and success criteria. A governance policy will be identified that will include data standards, processes and resources that will be required for interoperability and integration within the enterprise. Communications will also be a key responsibility of this organization. Communications with COIs of the GIG, BEA and domain teams will be key so that interoperability with the strategies of these components within the enterprise is ensured.

Metrics

To support the implementation and application of the Data management Strategy, metrics will be established and monitored. Metrics will support the evaluation of the success and effectiveness of the Data Management Strategy, as well as the participation of entities within the I&E Community. Metrics will be developed to support aspects of the strategy such as cost, performance against plan, I&E business and mission support, process effectiveness, COI and user participation support and satisfaction, and responsiveness to business and user needs.

Develop the Common Data Models, Shared Vocabulary, Taxonomy

As data requirements are identified in the development of the "As-Is" and "To-Be" I&E Domain architectures, common data models will be developed. The data in these models will be defined in terms of common business views, common business vocabulary and common business rules so as to provide a common understanding of data in terms of the I&E Community and the enterprise. This method will provide the basis for the creation of semantically neutral data models, with common definitions and rules so that in the case of the real property inventory. As a result, real property information can be viewed across the Department consistently, without regard to the source of the data and without regard to business rules and vocabularies maintained in the respective systems of the Military Services and Defense Agencies. These common data models will be used as the initial structures for the development of the "As-Is" and "To-Be", but will also be used to define new data assets arising from analysis and new requirements, e.g. new Core Data Elements required to support real property asset accountability, or new capabilities defined for the I&E Domain for support of business and mission requirements. Common data models support the lifecycle of information and data assets, and as such, will be an important part of the Data Management Strategy.

To be semantically neutral, a shared business vocabulary will be developed and used by all COIs referencing or using real property data assets. Where the I&E Domain and its COIs are identified as the authoritative source, this vocabulary will be defined and proposed by the Domain so that a clear understanding of the data is provided. This vocabulary will need to support and integrate with the EBPM and EDM products developed for the BEA as has been performed for Asset Accountability and the processes and data objects supporting it. This integration of the vocabulary will ensure the

understanding of the data in the enterprise, and promote its use by COIs and users both within and outside of the I&E Domain.

Taxonomies will be developed to support the classification and discovery of data assets within the metadata repositories. Users may not be aware of or understand the data assets of the Domain or of the enterprise. Discovery support the location of these assets by COIs and users. By developing taxonomies and applying these to data assets, users can discover data by querying metadata repositories for certain classes or types of data which correlate to taxonomies, e.g. asset. The once locating "asset", users can drill down through the taxonomy(s) until the desired data is located. The metadata stored for these data assets provides the user with an understanding of this data, e.g. definitions, business rules, validation criteria and data translation rules.

Metadata Repository

Metadata describes the information and data assets of an enterprise. The I&E Domain will develop and propose and implement an approved architecture that will support the registration and publishing of real property metadata. The I&E Domain will register metadata as required per DoD CIO policy. Registration and publishing of real property metadata will allow users and applications to quickly discover and identify which data are most valuable to them, and to determine the source of the data, its classification, and other important attributes of the data. Publishing will also promote DoD-wide enterprise interoperability by providing all users with the ability to discover, access and understand the data assets used in the support of the I&E Domain and its mission.

The I&E Domain and RPI COIs will register metadata in the I&E Domain metadata registry. This metadata will represent the Core Data Elements identified for the RPI as contained in the common data model and OV-7 of the Operational View. In addition to attributes to identify I&E data assets, structured attributes will be defined in the metadata registry that will facilitate the discovery and understanding of data real property data assets by the user as well as support DoD-wide enterprise interoperability. In this process, the cost of gathering data must be considered against the cost of not doing so. In general, the cost of gathering data once and maintaining it going forward is not as significant when compared to the cost of software and data correction after the fact due to errors in requirements analysis and systems design.

Configuration management procedures will be developed by the I&E Domain and COIs and implemented to ensure the integrity of all metadata. Subscription services will be implemented so that COIs and uses of real property data can be notified of additions and changes to real property data assets.

Common Data Model and Data Mapping

The common data model represents a semantically neutral model designed to promote understanding and interoperability of real property data. Definitions, business rules, domain rules and validation criteria defined for the Core Data Elements represent the common agreed-upon solution proposed by the I&E Domain and real property COIs.

Real property data asset data elements used by the Military Services and Defense Agencies will be mapped to the attributes defined in the common data model. These

assets exist in physical data schemas associated with legacy systems, systems in development, and ERP and COTS systems. Performing this mapping will present a single, logical information model for real property data, thereby capturing the meaning of data one time in the common data model and relating it to physical data elements used in the real property systems of the COIs. In addition, data assets contained in the common data model will be mapped to data objects identified in the EBPM (OV-6c in the Operational View). These data objects represent groupings of data elements, e.g. a contract, that are used in the enterprise and exchanged in business processes.

Once in place, the common data model and the metadata registry will form the basis for management of the information and data assets of the I&E Domain and COIs. The meaning of data will be captured and mapped once, supporting the identification of authorized sources for data with regard to real property. New data assets will be generated from the common information model using metadata from the real property metadata registry which will provide common terminology initially, eliminating the need for data mapping. Also, having a comprehensive inventory of real property data assets will allow for impact analysis of proposed changes to be performed providing improved planning and smoother integration of changes into real property and enterprise systems. This centralized data environment will simplify the implementation and enforcement of configuration management for the I&E Domain and COIs, providing an integrated facility the management of real property information and data asset management.

Services, working groups with GIG, BMMP, for services to be provided, integration, GAP

The I&E Domain and real property COIs will need to become active participants in the GIG and BMMP working groups with regard to metadata policy, architecture and services. DoD is in the process of developing policy, standards and infrastructure to support metadata management for the enterprise. The DoD effort is in support of the GIG, while BMMP in support of the BEA is in the process of drafting requirements and standards for metadata and services to support the Business Enterprise Mission Areas. These services will be the vehicles for a common set of tools that will provide the capabilities for management of metadata within the enterprise.

The Business Enterprise Architecture Net-Centric Strategy Version 2.0 dated April 30, 2004, defines the vision of Business Enterprise Services (BES) that will provide specific capabilities for DoD business management enabling improved business operations and providing timely, accurate, and reliable information reporting. The BEA Net-Centric Strategy organizes services into 3 categories:

- Business Enterprise Information Services (BEIS) – Capabilities that deliver functional and integrated business information to meet the data goals of the DoD. These services provide the capability for publishing, access, search and presentation of metadata related to enterprise information and data assets.
- Business Process Manager Services (BPMS) – Capabilities that execute solution-oriented business processes and controls their interactions with GIG entities and data sources, and business partners. These services will manage human-

interruptible workflow through long-running, end-to-end transactions, and their corresponding authorized delegation.

- Knowledge Services – Capabilities concerned with creating, building, compiling, organizing, transforming, pooling, disseminating, transferring, applying, and safeguarding knowledge. Examples of BEA knowledge may include, among others, budget guidance and financial management regulations and interpretations.

These services may well provide the I&E Domain and real property COIs with the services required to make real property information and data assets visible, accessible, understandable and usable for users of real property data. In addition, the I&E Domain and real property COIs may require additional services to support the specific needs of real property users.